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Comparative Investigation in Stray Light Measurement in the Human Eye

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Introduction

In order to validate Hartmann-Shack (HS) wavefront aberrometer to measure stray light, appropriate parameters for a modified aberrometer (WASCA, Carl Zeiss Meditec AG) were developed and compared with those of C-Quant and Pentacam (OCULUS Optikgeräte GmbH).

Methods

Forty subjects ranging in age from 23 to 75 with spherical ametropia of -0.25 to 0.25 dioptre were examined in this study. Stray light parameters PSF-contrast, PSF-cross-sectional area at half maximum (PSF-CAHM) of the HS-images, line average of the lens in a vertical Pentacam image and the Log(S) stray light parameter of C-Quant were compared to age and among each other.

Results

PSF-contrast and PSF-CAHM are significantly correlated with age (PSF contrast: $r = -0.467$; $p < 0.001$; PSF-CAHM: $r = 0.557$; $p < 0.001$). The C-Quant stray light parameter Log(S) is also significantly correlated with age ($r = 0.514$; $p < 0.001$) as well as the Pentacam line average ($r = 0.724$; $p < 0.001$). Correlation among each other is weak but significant ($r \approx 0.3$-0.4; $p \leq 0.038$). A spurious correlation with age due to the age dependency of pupil size can be excluded.

Conclusion

The expected age dependency of stray light parameters was verified for all methods. Best correlation was found for the Pentacam line average. The weaker correlation of the C-Quant parameter Log(S) implies a wider statistical spreading of the parameter due to the subjective measurement method. Weak age correlation of the WASCA parameters is probably caused by superposition of the stray light with higher order aberrations and fundus scatter. Potential causes for the weak correlation among each other are the subjects individual characteristics in conjunction with the influence of the different measurement principles e.g. backward scatter (Pentacam), small angle forward scatter (WASCA) and wide angle forward scatter (C-Quant).